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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/806,118	03/23/2004	Edward Hurley	INTEL-0069	2131

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EXAMINER	
BEVERIDGE, RACHEL E	
ART UNIT	**PAPER NUMBER**
1725	

DATE MAILED: 01/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/806,118	HURLEY ET AL.	
	Examiner	Art Unit	
	Rachel E. Beveridge	1725	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) *18-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-30* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/22/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-17, drawn to a method of preparing and bonding a thermal interface material layer, classified in class 228, subclass 245.

II. Claims 18-30, drawn to the package created by preparing and bonding a thermal interface material layer, classified in class 438, subclass 122.

The inventions are distinct, each from the other because of the following reasons:

Inventions Group I and Group II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the package of Group II can be created by adhesive bonding.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

IF APPLICANT ELECTS GROUP II, THEN APPLICANT MUST ADDITIONALLY ELECT FROM THE FOLLOWING SPECIES.

This application contains claims directed to the following patentably distinct species of the claimed invention:

IIA. Claims 18-27, drawn to a device and chip package.

IIB. Claims 28-30, drawn to a computer system.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, no claims are generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

During a telephone conversation with David Oren on November 22, 2005 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-17. Affirmation of this election must be made by applicant in replying to this

Office action. Claims 18-30 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Oath/Declaration

The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

> The oath or declaration is defective because:
> It does not identify the mailing address of each inventor. A mailing address is an address at which an inventor customarily receives his or her mail and may be either a home or business address. The mailing address should include the ZIP Code designation. The mailing address may be provided in an application data sheet or a supplemental oath or declaration. See 37 CFR 1.63(c) and 37 CFR 1.76.
>
> The mailing addresses of each inventor are missing the ZIP code.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent

> granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 1-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Rumer et al. (US 2003/0178730 A1).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

With respect to claim 1, Rumer discloses a preattached thermal interface material that is typically flat and adapted to interface with the surface of the heat generating device (Rumer, p.2, ¶ 0025, lines 4-8). Rumer also discloses a heat dissipating device having a phase change thermal interface material (p.1, ¶ 0015, lines 1-3) of which undergoes a solid to liquid transition and then dispenses it onto the surface so that it adheres to the surface where it solidifies on the surface when it cools

(p.2, ¶ 0017, lines 3-8) to form a continuous path of thermal conductivity through the material (p.2, ¶ 0021, lines 14-15).

With regard to claim 2, Rumer's figures 2 and 3 show a heat spreader (14) with a preattached phase change thermal interface material (16) deposited onto a surface (18) (p.2, ¶ 0026, lines 1-5).

Regarding claim 3, the definition of intermetallic bond is known to be the connection between two or more metals or between a metal and non-metal. Rumer discloses liquid phase change thermal interface material flows into any gaps in the surface of the heat generating device and heat dissipating device resulting in very low contact resistance and thermal interfacial resistance (p.2, ¶ 0018, lines 6-9).

With regard to claim 4, Rumer discloses a layer of solder flux (111) that is dispensed onto the surface of the semiconductor die as shown in figure 4(b) (p.3, ¶ 0029, lines 9-11). Figures 4(a)-4(g) further show placement of solder (112) and another layer of solder flux (113) and the positioning of an integrated heat spreader (140) onto the layers (p.3, ¶ 0029, lines 12-15).

With respect to claim 5, Rumer discloses Nickel particles as thermally conductive non-fusible fillers (p.2, ¶ 0021, lines 5-8).

Regarding claim 6, Rumer discloses heating the thermal interface material until it undergoes a solid to liquid transition, applying it in liquid form to the surface of the heat spreader that will contact the semiconductor die (p.3, ¶ 0027, lines 3-7), and then cooling the deposited material until it solidifies and adheres to the surface of the heat spreader (p.3, ¶ 0027, lines 11-12).

Regarding claim 7, Rumer discloses fusible fillers including, but not limited to, "In, In/Sn, In/Ag, Sn/Ag/Cu, Sn/Bi, In/Sn/Bi, and In/Zn" (p.3, ¶ 0021, lines 9-11).

With regard to claim 8, Rumer discloses a heat dissipating device made of thermally conductive material including, but not limited to, copper and aluminum (p.2, ¶ 0025, lines 1-4).

With respect to claim 9, Rumer discloses reflowing the solder (112) under heat as shown in figure 4(f) (p.3, ¶ 0029, lines 15-16). Rumer also discloses heating the assembly so that the thermal interface material undergoes a solid to liquid phase change so that the material flows to fill gaps between the heat spreader and the semiconductor die, then the material is allowed to cool and solidify (p.3, ¶ 0028, lines 7-11).

Claims 1-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Sreeram et al. (US 6,653,741 B2).

With respect to claim 1, Sreeram discloses a "substrate" referring to a semiconductor and/or a heat sink component and/or any other article, device, or apparatus, etc. which is joined to another with a thermal interface material (TIM) (Sreeram, col. 3, lines 27-30). Sreeram also discloses the TIM should bond to the substrate at a temperature less than the failure temperature of the active electronic device (col. 3, lines 31-33) and that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38).

With regard to claim 2, Sreeram discloses that the TIM preferably does not require extrinsic fluxing (col. 4, lines 36-39).

Regarding claim 3, Sreeram states that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38).

With regard to claim 4, Sreeram discloses "pre-wetting" the components to ensure bonding with the bonding component during reflow (col. 7, lines 42-44).

With respect to claim 5, Sreeram discloses active solder and TIM's that can wet non-metallic surfaces, such as Au, Au/Ni, and Ni (col. 5, lines 58-59).

Regarding claim 6, Sreeram discloses materials that enhance the thermal conductivity of the component, such as silver, copper, and gold (col. 3, lines 63-66). Sreeram discloses that these metals typically have relatively high melting temperatures (col. 3, lines 66-67). Also, Sreeram states that chemical fluxing is used when attempting to join items with conventional solders at temperatures below about 300° (col. 4, lines 26-28).

With respect to claim 7, Sreeram discloses active solder comprising indium (col. 5, lines 5-6).

Regarding claim 8, Sreeram discloses a heat sink or a heat spreader made of copper and/or aluminum components (col. 1, lines 14-15).

With regard to claim 9, Sreeram discloses knowledge in the art regarding reflowing so that the solder melts and wets by surface tension and/or local surface alloying; therefore, the interfaces of the components are intermetallic or interdiffused

metals (col. 1, lines 51-55). Sreeram teaches heating the TIM until molten and then contacting the substrate and allowing it to cool, solidify and bond (col. 7, lines 20-24). Furthermore, Sreeram states that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rumer et al. (US 2003/0178730 A1) as applied to claim 1 above, and further in view of Totino et al. (US 2002/0079355 A1).

With respect to claims 10-12 and 14, Rumer discloses reflowing the solder (112) under heat as shown in figure 4(f) (Rumer, p.3, ¶ 0029, lines 15-16). Rumer also discloses heating the assembly so that the thermal interface material undergoes a solid to liquid phase change so that the material flows to fill gaps between the heat spreader and the semiconductor die, then the material is allowed to cool and solidify (p.3, ¶ 0028, lines 7-11). However, Rumer lacks disclosure of a vacuum chamber with an inert environment under vacuum conditions. Totino discloses introducing the assembly into a "controlled-atmosphere" chamber, such as a vacuum chamber (10) with means of

heating (11) (Totino, p.2, ¶ 0020, lines 1-4). Totino also discloses controlling the atmosphere in the chamber (10) by forming a vacuum in the chamber or replacing the atmosphere in the chamber with an inert gas (p.2, ¶ 0021, lines 1-4). Furthermore, Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (p.2, ¶ 0029, lines 1-3). Rumer discloses reflowing the solder (112) under heat as shown in figure 4(f) (Rumer, p.3, ¶ 0029, lines 15-16). Rumer also discloses heating the assembly so that the thermal interface material undergoes a solid to liquid phase change so that the material flows to fill gaps between the heat spreader and the semiconductor die, then the material is allowed to cool and solidify (p.3, ¶ 0028, lines 7-11). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Rumer to include the vacuum chamber with inert gas atmosphere and pressure of Totino in order to establish a mechanical link between the layers (Totino, p.1, ¶ 0011, lines 6-7), enhance the strength of the bonding process (Totino, p.1, ¶ 0013, lines 1-2), and so that the support and coating are tightened against each other to compress the brazing material (Totino, p.2, ¶ 0029, lines 3-5).

With respect to claim 13, Totino discloses the vacuum at a "fairly high" pressure so that the residual pressure in the chamber is less than 10^{-4} mbar, typically between 10^{-4} and 10^{-5} mbar (Totino, p.1, ¶ 0016, lines 1-5). Put another way, Totino teaches the fairly high vacuum pressure to be an art recognized result effective variable depending on the type of material to be used. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the invention of Rumer to

include the fairly high pressure of Totino in order to avoid contamination of the assembly and/or possible pollution by the gas of the controlled atmosphere to prevent weakening of the metallic solder at the heating temperature (Totino, p.1-2, ¶ 0016, lines 5-10). That is it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed ranges through process optimization, since it has been held that there are general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

Claims 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sreeram et al. (US 6,653,741 B2) as applied to claim 1 above, and further in view of Totino et al. (US 2002/0079355 A1).

With respect to claims 10-12 and 14, Sreeram discloses materials that enhance the thermal conductivity of the component, such as silver, copper, and gold (Sreeram, col. 3, lines 63-66). Sreeram discloses that these metals typically have relatively high melting temperatures (col. 3, lines 66-67). Also, Sreeram states that chemical fluxing is used when attempting to join items with conventional solders at temperatures below about 300° (col. 4, lines 26-28). Sreeram discloses knowledge in the art regarding reflowing so that the solder melts and wets by surface tension and/or local surface alloying; therefore, the interfaces of the components are intermetallic or interdiffused metals (col. 1, lines 51-55). Sreeram teaches heating the TIM until molten and then contacting the substrate and allowing it to cool, solidify and bond (col. 7, lines 20-24).

However, Sreeram lacks disclosure of a vacuum chamber with an inert environment under vacuum conditions. Totino discloses introducing the assembly into a "controlled-atmosphere" chamber, such as a vacuum chamber (10) with means of heating (11) (Totino, p.2, ¶ 0020, lines 1-4). Totino also discloses controlling the atmosphere in the chamber (10) by forming a vacuum in the chamber or replacing the atmosphere in the chamber with an inert gas (p.2, ¶ 0021, lines 1-4). Furthermore, Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (p.2, ¶ 0029, lines 1-3). Sreeram discloses knowledge in the art regarding reflowing so that the solder melts and wets by surface tension and/or local surface alloying; therefore, the interfaces of the components are intermetallic or interdiffused metals (Sreeram, col. 1, lines 51-55). Sreeram teaches heating the TIM until molten and then contacting the substrate and allowing it to cool, solidify and bond (col. 7, lines 20-24). Sreeram states that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38). Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (Totino, p.2, ¶ 0029, lines 1-3). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Sreeram to include the vacuum chamber with inert gas atmosphere and pressure of Totino in order to establish a mechanical link between the layers (Totino, p.1, ¶ 0011, lines 6-7), enhance the strength of the bonding process (Totino, p.1, ¶ 0013, lines 1-2), and so that the support and coating are tightened against each other to compress the brazing material (Totino, p.2, ¶ 0029, lines 3-5).

With respect to claim 13, Totino discloses the vacuum at a "fairly high" pressure so that the residual pressure in the chamber is less than 10^{-4} mbar, typically between 10^{-4} and 10^{-5} mbar (Totino, p.1, ¶ 0016, lines 1-5). Put another way, Totino teaches the fairly high vacuum pressure to be an art recognized result effective variable depending on the type of material to be used. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the invention of Rumer to include the fairly high pressure of Totino in order to avoid contamination of the assembly and/or possible pollution by the gas of the controlled atmosphere to prevent weakening of the metallic solder at the heating temperature (Totino, p.1-2, ¶ 0016, lines 5-10). That is it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed ranges through process optimization, since it has been held that there are general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

Claims 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rumer et al. (US 2003/0178730 A1) in view of Totino et al. (US 2002/0079355 A1).

With respect to claims 15-17, Rumer discloses reflowing the solder (112) under heat as shown in figure 4(f) (Rumer, p.3, ¶ 0029, lines 15-16). Rumer also discloses heating the assembly so that the thermal interface material undergoes a solid to liquid phase change so that the material flows to fill gaps between the heat spreader and the semiconductor die, then the material is allowed to cool and solidify (p.3, ¶ 0028, lines 7-

11). Furthermore, Rumer discloses reflowing the solder (112) under heat as shown in figure 4(f) (p.3, ¶ 0029, lines 15-16). Rumer's figures 2 and 3 show a heat spreader (14) with a preattached phase change thermal interface material (16) deposited onto a surface (18) (p.2, ¶ 0026, lines 1-5). Rumer discloses Nickel particles as thermally conductive non-fusible fillers (Rumer, p.2, ¶ 0021, lines 5-8). However, Rumer lacks disclosure of a vacuum chamber with an inert environment under vacuum conditions. Totino discloses introducing the assembly into a "controlled-atmosphere" chamber, such as a vacuum chamber (10) with means of heating (11) (Totino, p.2, ¶ 0020, lines 1-4). Totino also discloses controlling the atmosphere in the chamber (10) by forming a vacuum in the chamber or replacing the atmosphere in the chamber with an inert gas (p.2, ¶ 0021, lines 1-4). Furthermore, Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (p.2, ¶ 0029, lines 1-3). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Rumer to include the vacuum chamber with inert gas atmosphere and pressure of Totino in order to establish a mechanical link between the layers (Totino, p.1, ¶ 0011, lines 6-7), enhance the strength of the bonding process (Totino, p.1, ¶ 0013, lines 1-2), and so that the support and coating are tightened against each other to compress the brazing material (Totino, p.2, ¶ 0029, lines 3-5).

Claims 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sreeram et al. (US 6,653,741 B2) in view of Totino et al. (US 2002/0079355 A1).

With respect to claims 15-17, Sreeram discloses a "substrate" referring to a semiconductor and/or a heat sink component and/or any other article, device, or apparatus, etc. which is joined to another with a thermal interface material (TIM) (Sreeram, col. 3, lines 27-30). Sreeram also discloses the TIM should bond to the substrate at a temperature less than the failure temperature of the active electronic device (col. 3, lines 31-33) and that the solder melts and wets the substrate to allow the formation of a chemical and/or mechanical bond between the TIM and the substrate when solidified (col. 3, lines 35-38). Sreeram discloses materials that enhance the thermal conductivity of the component, such as silver, copper, and gold (Sreeram, col. 3, lines 63-66) and discloses that these metals typically have relatively high melting temperatures (col. 3, lines 66-67). Also, Sreeram states that chemical fluxing is used when attempting to join items with conventional solders at temperatures below about 300° (col. 4, lines 26-28). Sreeram discloses knowledge in the art regarding reflowing so that the solder melts and wets by surface tension and/or local surface alloying; therefore, the interfaces of the components are intermetallic or interdiffused metals (col. 1, lines 51-55). Sreeram teaches heating the TIM until molten and then contacting the substrate and allowing it to cool, solidify and bond (col. 7, lines 20-24). Sreeram discloses that the TIM preferably does not require extrinsic fluxing (col. 4, lines 36-39). Sreeram discloses Nickel particles as thermally conductive non-fusible fillers (Sreeram, p.2, ¶ 0021, lines 5-8). However, Sreeram lacks disclosure of a vacuum chamber with an inert environment under vacuum conditions. Totino discloses introducing the assembly into a "controlled-atmosphere" chamber, such as a vacuum chamber (10) with

means of heating (11) (Totino, p.2, ¶ 0020, lines 1-4). Totino also discloses controlling the atmosphere in the chamber (10) by forming a vacuum in the chamber or replacing the atmosphere in the chamber with an inert gas (p.2, ¶ 0021, lines 1-4). Furthermore, Totino discloses applying mechanical plating pressure on the assembly before and/or during reheating (p.2, ¶ 0029, lines 1-3). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the invention of Sreeram to include the vacuum chamber with inert gas atmosphere and pressure of Totino in order to establish a mechanical link between the layers (Totino, p.1, ¶ 0011, lines 6-7), enhance the strength of the bonding process (Totino, p.1, ¶ 0013, lines 1-2), and so that the support and coating are tightened against each other to compress the brazing material (Totino, p.2, ¶ 0029, lines 3-5).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rachel E. Beveridge whose telephone number is 571-272-5169. The examiner can normally be reached on Monday through Friday, 9 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

reb

JONATHAN JOHNSON
PRIMARY EXAMINER